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Report on

MACLEOD TOWNSITE WATER SUPPLY SYSTEM

TOWNSHIP OF ASHMORE

August 16, 1972

Sanitary Engineering Branch

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Report on Macleod townsite water supply system, township of Ashmore / Prankev, R.J.

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Peter Beeling

ONTARIO

MINISTRY OF THE ENVIRONMENT

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411 Donald Street East
Thunder Bay "F", Ontario
Telephone: 623-5591

Ref-72878

October 5, 1972

Mr. L. Weekley, President
MacLeod Townsite Association
Geraldton, Ontario

Dear Sir:

Re: TOWNSHIP OF ASHMORE - Water Works System

Enclosed is a report prepared by our Mr. R. J. Prankev, Civil Technologist, subsequent to his August 16, 1972 inspection of the water works system.

At the time of the inspection it was found that the operation of the water works was unsatisfactory. This status was derived from the fact that a Boil Water Order had to be implemented on the supply on August 10, 1972. It is possible, with efficient operation, as prescribed in the "Immediate Recommendations" of the report, that the need for the Order may have been prevented.

We therefore recommend that the Association review the report and proceed to implement the report's recommendations. Mr. Prankev will provide assistance, in the effecting of the recommendations, should the Association so request. The Association should bear in mind that any change to the existing water works requires the Ministry of the Environment's approval prior to the commencement of the work.

If there are any problems in understanding any aspects of the report or this letter please contact our office. We would further appreciate the Association's comments on the implementation of the "Immediate Recommendations".

Yours very truly,

J. R. Marsh, P.Eng.
Regional Engineer
Sanitary Engineering Branch

RJP/af

c.c. Mr. L. Eliason, Plumber
MacLeod Townsite
Geraldton, Ontario

Dr. J. Pickersgill, M.O.H.
Thunder Bay Health Unit

Mr. J. Scott, CPHI
Thunder Bay Health Unit

Mr. G.H. Kay
Mr. G.H. Mills
Central Records
District File
Regional File

17792

DISTRICT ENGINEERS BRANCH - FIELD INVESTIGATIONS

MUNICIPALITY - Township of Ashmore

DATE - August 16,1972

MATTER INVESTIGATED - MacLEOD TOWNSITE WATER SUPPLY SYSTEM

REPORT BY - R.J. Prankev
Civil Technologist

AT REQUEST OF - Routine

DISTRIBUTION OF REPORT -

Mr. L. Weekley,President
MacLeod Townsite Association
Geraldton,Ontario

Mr. L. Eliason,Plumber
MacLeod Townsite
Geraldton,Ontario

Dr. J. Pickersgill, MOH
Thunder Bay Health Unit

Mr. J. Scott, CPHI
Thunder Bay Health Unit

Mr. G.H. Kay,Supervisor
Water Works

Mr. G.H. Mills,Supervisor
Design Approvals

Central Records

District File

Regional File ✓

PETER BELLINGV

NO.	DATE PREPARED	DATE TYPED	TYPED BY	DATE APPROVED	DATE MAILED
	August 31,1972	Sept. 1972	:sj	Oct. 2/72	Oct. 5/72

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TOWNSHIP OF ASHMORE

MACLEOD TOWNSITE WATER SUPPLY SYSTEM

C O N T E N T S

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ONTARIO

REPORT

MINISTRY OF THE ENVIRONMENT

Municipality..Township of Ashmore.....Date of Inspection..August 16,1972

Re:..MacLEOD TOWNSITE WATER SUPPLY SYSTEM.....

Inspection by..R.J. Prankev, Civil Technologist.....Report by..R.J. Prankev, Civil Technologist...

I. INTRODUCTION

On August 16,1972 Mr. R.J. Prankev, Civil Technologist, in the presenceof Mr. L. Eliason, Plumber, carried out a routine inspection and a special investigation on the water system in regard to the "Boiled Water Order" issued on the system. The Order was issued by the Thunder Bay Health Unit at the request of the District Engineers Section of the Ministry of the Environment subsequent to having reviewed the bacteriological results of the 1972 water samples. During the months of June and July 60 per cent of the treated water samples analysed were adverse.

II SUMMARY

The numerous recommendations and the issuance of a Boiled Water Order on the water supply system indicate the present unsatisfactory operation of the water works.

The operation of the water works would be substantially elevated by the incorporation of all the Immediate Recommendations. This is not meant to detract from the significance of the secondary recommendations, but only to emphasize the importance of immediate action in implementing the Immediate Recommendations.

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Although there is no recommendation regarding the need for the Association to retain a firm of consulting engineers in major alterations, it is hoped that the members of the Association will definitely follow this type of procedure. Especially since any change outside of routine maintainance requires Ministry approval.

III DESCRIPTION OF SYSTEM

A. Water Works

Water is drawn from Lake Kenogamisis and undergoes disinfection prior to distribution to the consumer. Appendices 1 and 2 provide specifications on the waterworks equipment and a general plan of the water works.

B. Distribution System

The distribution system consists of approximately two miles of variable diameter main together with six water hydrants. The estimated average diameter of the mains is approximately six inches. See Appendix 3 for details.

IV OPERATION OF WATERWORKS

A. Pumps

The existing service pump is started manually. Further the service pump runs continuously providing water and water pressure to the distribution system. Subsequent to any power failure the service pump will remain off until it is manually re-started. The start-up procedure would be to determine that the pump was off, drive approximately

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four miles to the pump-house and re-start the pump. There are no check valves on the distribution system to prevent reverse flow while the pump is off.

The existing stand-by, when in operation, draws its water from the intake well which is below the three pumps. This pump would also have to be started manually.

Mr. Eliason hopes to utilize the lower capacity pump as a service pump drawing raw water from a lake intake. It is hoped that the using of this pump would reduce the presently high monthly water bills ($10.00 per household).

B. Chlorinator

Only the service chlorinator was connected to the system at the time of inspection. The stand-by chlorinator, although available since May, was still disassembled.

At the time of the inspection raw water was drawn from the main by means of a small turbine pump powered by a Sangamo three horse power motor. The raw water passed through the chlorinator, producing high chlorine residual solution and returned to the main for disinfection of the consumer water. The chlorinator is equipped with a main water flow sensor which restricts the addition of chlorine solution to the chlorinator pumped water when there is no flow in the main.

Further, the chlorinator was set to feed between 18-20 pounds of chlorine per 24 hours with the total available chlorine residual after 15 minutes being about 1.4 ppm at the pumphouse.

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There have been certain problems experienced in effecting chlorination of the water as a result of raw water particulates clogging up the screen on the suction side of the chlorinator. This interference, from time to time, has impeded satisfactory disinfection. In addition it was ascertained that the operator would undertake the required screen cleaning, on the chlorinator, to make it functional without stopping the service pump.

Firstly, any cessation in the disinfection of the raw water, especially when the raw water is consistently adverse, presents a potential health hazard to the consumer. In this respect it is mandatory that either there is a reasonable guarantee that there is no stoppage in disinfection of the raw water and/or any disinfection cessation is accompanied with a cessation of water transmission to the main.

It is therefore recommended as an interim and immediate measure:

1) that the suction side of the chlorinator draws its water from a tank which is filled with screened water so as to prevent the clogging of the chlorinator screen

2) that a check valve be installed in the main to prevent reverse flow

3) that the stand-by chlorinator be made functional immediately

4) that consideration be given to the installation of an alarm system associated with the operation of the chlorinator

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C. Main Flushing

To the present time there has not been a regular semi-annual main flushing program in effect by the operator of the water works.

This year due to the adverse water quality resulting in the issuance of a Boiled Water Order, the operator undertook to flush the mains by opening one hydrant for approximately 25 minutes.

During the night of August 16 and 17 a second main flushing and main disinfection program was undertaken. The hydrant at the extremity of the golf course was opened and the chlorine feed rate increased to effect a main disinfection. It took approximately 1½ hours for the chlorine residual at the hydrant to go from 0 ppm to 2 ppm. At the pumphouse the total available chlorine residual was above 6 ppm after 1 hour contact time. The flushing continued from midnight to 3 a.m. after which time three other hydrants were opened for the purpose of flushing and disinfection. A 2.0 ppm chlorine residual was recorded at these latter hydrants.

Subsequent to having flushed the latter hydrants and an objection by the operator to flush the remaining two hydrants, the chlorine feed rate was cut down from about 35 pounds per 24 hours to 11 pounds per 24 hours to give a 1.0 ppm residual after 1 hour of contact. The recorded residual at the golf course hydrant was 0.75 ppm one and a half hours after the adjustment to the chlorinator.

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It was suggested to the operator that the chlorine feed rate should be increased to produce at least a 0.2 ppm total available chlorine residual at all extremity points. The operator increased the chlorine feed rate to approximately 20 pounds per 24 hours resulting in a 2.0 ppm residual after 15 minutes contact time at the pumphouse but no residual was measurable at the golf course hydrant.

D. General Maintainance at the Pumphouse

It had been suggested last May to the operator that the present condition of the pumphouse was unsatisfactory in regard to hygiene. Debris, such as old pipes, electrical control panels, pieces of lumber, was lying around. Although the clean up suggestion had been made last May ; to date no action has been taken by the operator.

No water works system can possibly operate efficiently if general maintainance as cited is not carried out. An important improvement that the operating authority should undertake should be the clean up of the pumphouse interior. Following the above clean up the intake well should be cleaned and disinfected ready for use.

E. Water Consumption

There is no metering of the water consumption at the present time. As an estimate there are approximately 70 residences on the system in addition to the golf course and the Coast Hotel. The water consumption on a daily basis by the residences would be approximately 24,000 Imp. gallons and the

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golf course consumption would be in the area of 10,000 Imp. gallons per day. Reportedly there are approximately 50 men staying at the Coast Hotel with the resulting estimated daily water consumption of 2,500 Imp. gallons. Therefore the total water consumption would be approximately 36,000 Imp. gallons.

During winter months the townsite residents allow the system bleeders to run in order to prevent the freeze-up of the system.

V WATER QUALITY OF WATERWORKS SYSTEM

A. Chemical

There were only two chemical water analyses, to date, performed on the water supplied to the community. From these results, generally the chemical water quality meets the MOE drinking water objectives for all parameters except colour and turbidity. The desirable objectives for these latter parameters are 5 and 1.0 units respectively. (See Appendix 4). For aesthetic reasons the above parameters should not be exceeded. Further, in turbid water, the suspended particulates tend to hide the bacteria and disinfection becomes more difficult, i.e. higher chlorine dosages are required and/or longer chlorine contact time is required. Colour and turbidity removal could be effected through chemical coagulation, settling and filtration. Ultimately, the operating authority should strive for a higher water quality.

Finally, in Appendix 10, the Ministry's drinking water objectives are presented for the operator's information.

B. Bacteriological

On August 4, 1972 a letter was sent to Dr. J. Pickersgill, M.O.H., by J.R. Marsh, District Engineer, requesting that the

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Thunder Bay Health Unit issued a "Boiled Water Order". This was as a result of having determined that during the months of June and July of the 12 treated water samples examined 60 per cent were adverse. (See Appendix 5).

Prior to the issuance of the order, Mr. J. A. Scott, CPHI, of the Thunder Bay Health Unit conducted some chlorine residual tests and bacteriological sampling on the water in the distribution system to try to determine the problem. Further the bacteriological samples collected indicated inadequate disinfection was taking place at various points in the system. Numerous resamplings were conducted by the TBHU to further substantiate the adverse water quality. The conclusion by the TBHU was that the safety of the drinking water could not be guaranteed by the treatment in effect and therefore the Boiled Water Order was issued on August 10, 1972, by the TBHU. TBHU reports are summarized in Appendix 6.

Prior to the previously cited main flushing of August 15 to 16 the disinfection of the mains plus the house connections was discussed with Mr. L. Weekley, President, MacLeod Townsite Association, Mr. L. Eliason, the operator, and Mr. E. Romaniuk of the TBHU. The former two gentlemen stated that the 70 households concerned could not be notified prior to the main flushing and the suggested house connection flushing. Therefore they indicated that only the main flushing and disinfection could take place and this would have to be during the night. The significance of properly disinfecting the house connections was pointed out to the two gentlemen.

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However, depending on the results of bacteriological samples collected after the disinfection, the operator may be required to undertake another flushing and disinfection of the mains and this time include the house connections and water heating tanks.

The enclosed results (Appendix 7) indicate that although the treated bacteriological samples were free of Fecal Coliform inadequate disinfection had taken place. However, it is felt that the mains were adequately disinfected and any contamination was possibly the result of:

1. contaminated house connection
2. interior house plumbing
3. the drop in the chlorine residual below a detectable level at the extremities.

Therefore it will be recommended that a reflushing of the water system be undertaken with the above conditions satisfied.

VI BACTERIOLOGICAL WATER QUALITY OF KENOGAMISIS LAKE

The bacteriological water quality of the lake in regard to the raw water taken in by the townsite water intake had been noticeably deteriorating. Consequently an investigation of the possible cause was undertaken by the Ministry of the Environment on August 15,1971.

The investigation consisted of the collection of bacteriological water samples and a site inspection. The bacteriological results are appended. (See Appendix 8)

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The site inspection revealed that there was no immediately obvious reason for the increase in bacteriological concentrations.

The bacteriological results indicate the need for further investigation. At the mouth of the Wintering River the collected sample indicates unaccountable human fecal contamination. Some additional sampling in the area of the intake should also be undertaken since the Total Coliform was twice as high as that of the surrounding area. This latter location contamination may be attributable to the shallowness of the lake around the intake i.e. 6-7 feet.

At the West Narrows there is a high Total Coliform count according to the collected sample. This count may be assumed to be caused by shallow water depth and contamination due to the Geraldton's inadequate sewage treatment. The Morton Townsite and East of the main narrows contamination should be further assessed as to the reason for the high Total Coliform counts in these areas. Some possibilities for the higher Total Coliform may be shallow (warmer) water, influence of Geraldton and/or waste water discharge from Morton Townsite and the camp.

The seriousness of the townsite's adverse water quality gives definite reasons for the further sampling. Consequently, further sampling is recommended and Appendix 9 relates suggested sampling locations.

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VII WATER WORKS SAMPLING PROGRAM

A. Chemical

Due to the inadequate available chemical data and as an effective water quality monitoring program, it is recommended that the operator collect and submit for analyses one raw 32 ounce water sample to our Regional Laboratory in Thunder Bay on a monthly basis.

B. Bacteriological

Under normal bacteriological water quality conditions it would be adequate if the operator submitted one raw water sample and one treated water sample per week from the pumphouse. In addition two treated water samples should be collected per month i.e. one from the MacLeod Townsite and one from the Morton Townsite.

Since the present bacteriological water quality has required the issuance of a Boiled Water Order it is recommended that the operator intensify the sampling program and submit the following samples on a weekly basis until such time as the Boiled Water Order is repealled:

Bacteriological Water Sample

1 - raw 6 oz. bacteriological water sample bottle from the pumphouse

1 - treated 6 oz. bacteriological water sample bottle from the pumphouse

1 - treated 6 oz. bacteriological water sample bottle from the golf course i.e. Tee #7

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1 - treated 6 oz. bacteriological water sample bottle from Murray's Store

1 - treated 6 oz. bacteriological water sample bottle from the hydrant near the reservoir

1 - treated 6 oz. bacteriological water sample bottle from the Coast Hotel

1 - treated 6 oz. bacteriological water sample bottle from Morton Townsite

Further it is recommended that with the above submissions that the operator submit a Total Chlorine residual reading at all the treated sampling locations at the time of sampling. It would be satisfactory for the operator to determine only flash residuals at the distribution system sampling location and the 15 minute contact time residual at the pumphouse location.

VIII DISCUSSION

A. Operation of Waterworks

There have to be definite alterations made to the system which should be catagorized as to their priorities. In discussing the operation of the works with Mr. Eliason it was determined that he is not familiar with the chlorinator as he should be. He requested a trouble shooting manual on the chlorinator. This type of request indicates his desire to operate the facilities more efficiently. However the manual would only hide and/or further complicate future instruction in the chlorinator operations. Consequently, the proper

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solution would be a course for operators offered by the Ministry of the Environment on Chlorination. This course would assist Mr. Eliason with all aspects of his particular chlorinator and further he would appreciate the significance of chlorination.

As cited in the main flushing section of this report semi-annual main flushing is generally a practiced procedure by most municipalities because of its effectiveness in reducing chemical and bacteriological contamination. Therefore it is recommended that the operator commence this fall on a regular basis of flushing the mains twice a year i.e. spring and fall.

There has been a suggestion made by the operator that the present bacteriological problems experienced in the system may be the result of low water consumption by the townsite and relatively high main capacity. The operator felt that it took approximately a day for the mains to have a complete water turn-over. However according to the calculated water consumption there should be approximately three complete turnovers per day. Nevertheless, if the operating authority strongly felt that their water quality was suffering as a result of low water consumption they should increase turnovers by more frequent main flushings and/or increase in water consumption through use of bleeders and more lawn watering.

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It would be in the interest of the Association to gauge, at the waterworks by a water meter, the daily water consumption.

Metering is required by the Ministry of the Environment in their determination of available water quantity for further development in any specific area.

B. Boiled Water Order

In the persistance of the adverse results following the main flushing of August 15-16 the Boiled Water Order should remain in effect.

To have the Order lifted the Ministry should receive three satisfactory sets of consecutive day samples of all the special cited locations. Subsequent to having had the mains, house connections and hot water tanks flushed and disinfected by the operator, bacteriological sampling should be undertaken.

The following is the suggested procedure for the elimination of the persistance of the adverse bacteriological samples:

1. Notify all residents of a main flushing and disinfection program.
2. Increase the chlorine feed rate so as to obtain at least a 5.00 ppm Total Available Chlorine Residual with 15 minutes of contact time at the pumphouse.

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3. Open the closest hydrant to the waterworks and monitor the residual until there is a marked increase in the chlorine residual.
4. Encourage all water consumers up to the hydrant to flush (run all taps, cold and hot)
5. Close down the above hydrant and open the next one in line
6. Encourage all water consumers between the hydrants to flush house connections and plumbing.
7. Continue steps 5 and 6 until the last hydrant has been flushed.
8. Close down the last hydrant and all house connections with the high chlorine residual in the mains for two hours.
9. Reduce the chlorine feed rate to normal i.e. 0.1 ppm Total Available Chlorine Residual should be measurable in the mains in the townsite.
10. Sample all special locations for three consecutive days submitting samples at the end of every day.
11. Resume special location sampling outlined in an earlier section on a weekly basis until further notification by the Ministry of the Environment and Thunder Bay Health Unit.

C. System Extensions and Changes

Under Section 41 of the OWRC Act 1971 any extension or change to existing waterworks requires the Ministry's approval prior to the undertaking of the above work.

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Therefore prior to connecting the stand-by chlorinator or changing to the lower capacity pump it is necessary that the operating authority submit an application to the Ministry for approval of the cited changes. Further depending on the complexity of the anticipated works an engineer's report may be requested by the Ministry.

IX RECOMMENDATIONS

A. Immediate

1. The operator should commence the weekly special bacteriological location sampling and associated chlorine residual monitoring.
2. The operator should increase the chlorine feed rate until a 0.1 ppm Total Available Chlorine residual is detectable in extremity portions of the system.
3. The operating authority should undertake the procurement of a tank and screens for the screening of the chlorinator feed water.
4. The operator should carry out the required general maintainance on the waterworks and intake well.
5. The operator together with the Association should ensure that the describedmain and house connection flushing and disinfection program is carried out.

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6. The bacteriological sampling, to try to have the Boiled Water Order lifted should be carried out.
7. The operator should connect the stand-by chlorinator subject to approval by the Ministry of the Environment.

B. Secondary

1. The operating authority should ensure that there is a check valve installed in the system.
2. The operator should undertake semi-annual main flushing as described.
3. The proposed stand-by pump should be connected subject to Ministry of the Environment approval.
4. The Association should undertake the installation of chlorine feed detection equipment.
5. A meter for the monitoring of the water consumption should be installed at the waterworks.
6. The operator should be trained in the operation of his special chlorination equipment.
7. The chemical and bacteriological sampling programs should continue.
8. The Association should undertake further sampling of The Kenogamisis Lake as described in the report.
9. The operator should try to obtain all equipment specification and submit a copy to our Regional Office.

RJP:sj

Prepared by:
R.J. Prankev, Civil Technologist

Appendix 1

Township of Ashmore

-MacLeod Townsite-

Water Work Equipment Specification

INTAKE

-8 inch diameter iron pipe in 6-7 feet of water

-Intake well for stand-by pump only 20 x 5 x 20 feet

PUMPS

-present service pump B.W. & McC. Ltd. Galt
turbine type estimated capacity of 400 U S gpm
powered by English Electric Motor Type D Frame 44ss
50 HP 550 volts 1760 RPM 47 A

-present stand-by pump system similar to present service

-proposed service pump unknown make
turbine type estimated capacity of 200 US gpm
powered by English Electric Motor Model E N 51054
Type K F 25 HP 1760 RPM 550 Volts 24.5 A

CHLORINATION

-service chlorinator Wallace & Tiernan
variable V notch capacity 50 pounds per 24 hours

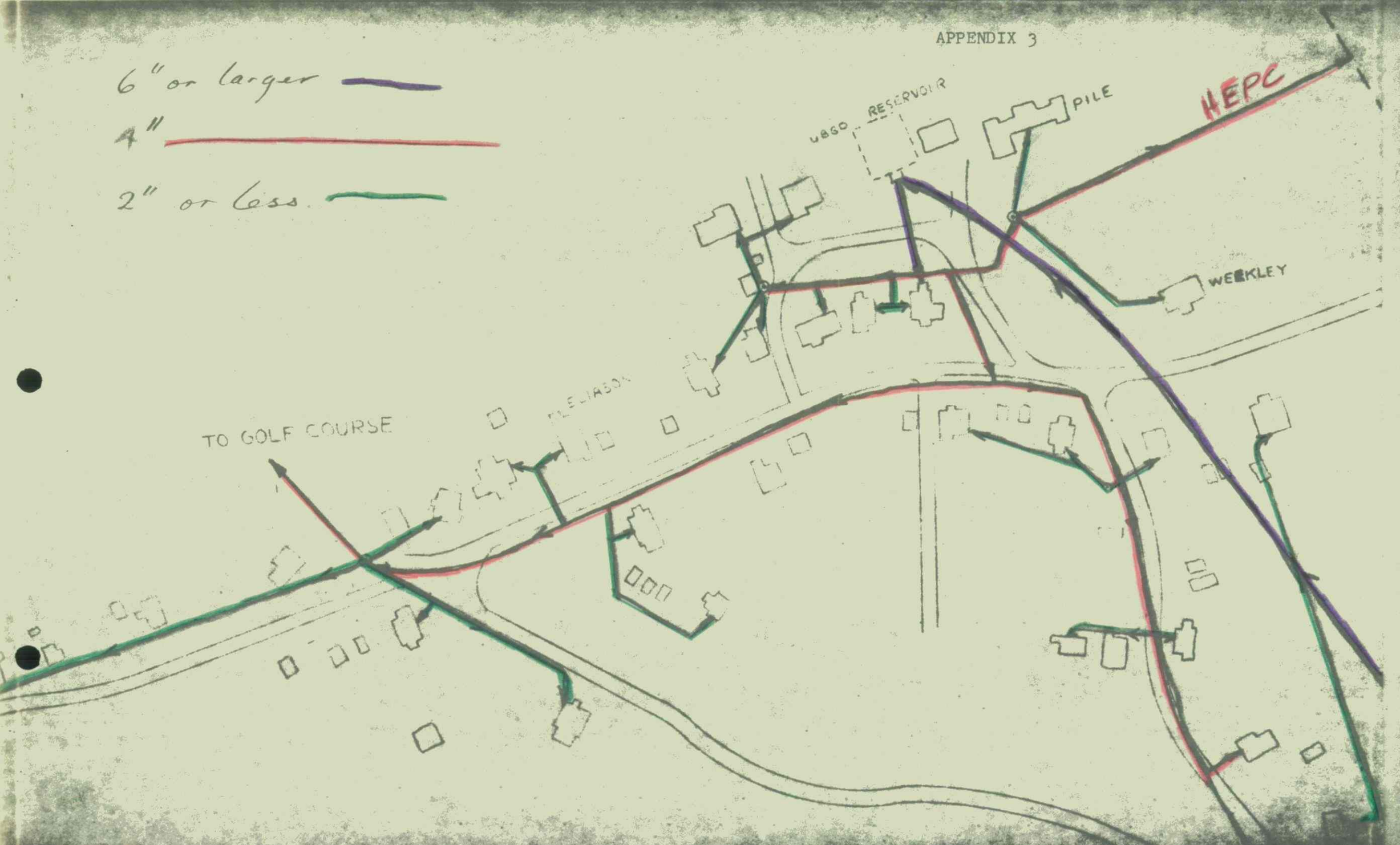
-proposed stand-by Wallace & Tiernan straight V notch capacity of 25 pounds per 24 hours

MAINS AND HYDRANTS

-As described in Appendix 3

APPENDIX 2

TOWNSHIP OF ASHMORE
MUNICIPAL W.W. PLAN
N.T.S.


6" or larger
4"
2" or less.
USGS RESERVOIR
PILE
HEPC
WEEKLEY
TO GOLF COURSE

All analyses except pH reported in ppm unless otherwise indicated.

Appendix 4

MUNICIPALITY Twp of Ashmore WATERWORKS

						Raw						
Date Sampled					May 29		July 24					
Hardness as $CaCO_3$					64		83					
Alkalinity as $CaCO_3$					60		81					
Chloride as Cl					<1		<1					
pH					7.4		7.9					
Iron as Fe					.30		.20					
Phenol in ppb												
Apparent Colour Units					50		30					
Turbidity Units					1.3		2.0					
Fluoride												
Remarks												

TOWNSHIP OF ASHMORE - ANALYSES RESULTS

(RESULTS PER 100 ML)

WATER SAMPLES - 1972

Week Of	Location	Type	Total Coliforms	Background Colonies	Fecal Coliforms
January 2nd	Pumphouse	Raw	20	12	6
		Treated	0	0	0
16th	Pumphouse	Raw	2	0	0
		Treated	0	0	0
30th	Pumphouse	Raw	4	G300	0
		Treated	0	0	0
February 13th	Pumphouse	Raw	0	0	0
		Treated	0	0	0
27th	Pumphouse	Raw	40	276	0
		Treated	0	0	0
March 12th	Pumphouse	Raw	84	10500	0
		Treated	0	0	0
19th	Pumphouse	Raw	76	0	0
		Treated	0	0	0
April 2nd	Pumphouse	Raw	8	0	0
		Treated	0	0	0
16th	Pumphouse	Raw	42	0	6
		Treated	0	0	0
30th	Pumphouse	Raw	40	64	Clostridium Present
May 14th	Pumphouse	Raw	88	152	0
		Treated	0	0	0
28th	Pumphouse	Raw	232	21000	8
		Treated	0	0	0

* "G" means greater than

- - continued Page 2

Appendix 5.

Week Of		Location	Type	Total Coliforms	Background Colonies	Fecal Coliforms
June	11th	Pumphouse	Raw	1500	14200	0
			Treated	28	140	0
	25th	Pumphouse	Raw	1200	1000	Pseudomonas Present
			Treated	174	G300*	-
July	2nd	Pumphouse	Raw	5300	6400	0
			Treated	17000	G600	0
		Coast Hotel	Treated	0	G300	0
		W.G. Morton House	Treated	88	G206	0
		L. Eliason House	Treated	2	0	0
	16th	Pumphouse	Raw	1000	G600	0
			Treated	16	G300	0
		D.S. Murray House	Treated	0	0	0
		Golf Course	Treated	0	G300	0
	23rd	Pumphouse	Raw	1200	G700	256
			Treated	0	G300	0
		W.G. Morton House	Treated	16	G300	4
		H. Pile House	Treated	0	0	0
	24th	Pumphouse	Raw	1200	7700	256
			Treated	0	G300	0
		Wm. Morton Res.	Treated	16	G300	4
		H. Pile Res.	Treated	0	0	0
	31st	Pumphouse	Raw	224	2900	20
			Treated	0	50	0
		L. Weekley	Treated	0	0	0
		Golf Course	Treated	0	0	0

* "G" means greater than

Township of Ashmore

Thunder Bay Health Unit

Date	Sampling Locations	Results	
		Total Coliform	Fecal Coliform
August 5,1972	Pumphouse *	34	0
	Pumphouse	0	0
	Morton's	4	0
	National Caterer's	0	0
	Murray's	0	0
	Weekley's	1	0
	Pile's	0	0
	Eliason's	0	0
	Golf Club	10	5
August 8,1972	Pumphouse *	0	0
	Pumphouse	15	0
	Morton's	0	0
	Weekley's	0	0
	National Caterer's	0	0
	Golf Club	0	0
August 9,1972	Pumphouse*	12	0
	Pumphouse	0	0
	Morton's	0	0
	Owen's	0	0
	Weekley's	0	0
	National Caterer's	0	0
	Golf Club	0	0
August 10	Pumphouse *	24	10
	Pumphouse	0	0
	Morton's	0	0
	National Caterer's	0	0
	Weekley's	0	0
	Golf Club	0	0
Issuance of Boiled Water Order			
August 11	Pumphouse*	14	6
	Pumphouse	0	0
	Morton's	0	0
	National Caterer's	0	0
	Murray's Store	0	0
	Weekley's	0	0
	Pile's	0	0
	Golf Club	0	0
	Eliason's	0	0
	Pumphouse *	26	4
	Pumphouse	0	0
	Morton's	1	1

* Raw Water Samples

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Appendix 6

Township of Ashmore

Thunder Bay Health Unit

Date	Sampling Locations	Results Total Coliform	Fecal Coliform
August 14,1972	Pumphouse *	12	0
	Pumphouse	0	0
	Morton's	0	0
	National Caterer's	0	0
	Weekley's	3	0
	Golf Club	4	0
August 15,1972	Pumphouse *	10	10
	Pumphouse	0	0
	Morton's	0	0
	National Caterer's	0	0
	Weekley's	0	0
	Golf Club	0	0
August 16,1972	Pumphouse *	16	2
	Pumphouse	0	0
	Morton's	0	0
	National Caterer's	0	0
	Weekley's	0	0
	Golf Club	0	0

- -

Total Treated Samples Examined 49

Total Treated Adverse Samples 7

* Raw Water Samples

MINISTRY OF THE ENVIRONMENT - LABORATORY BRANCH

BACTERIOLOGICAL REPORT

FILE: Twp. of Ashmore

	SAMPLED D M Y	ANALYSED D M Y	REPORTED D M Y
DATE:	16 872	18 872	29 872

3 3341 3 3347 Thunder Bay

REPORT TO: J.R. Marsh (Att: R. Frankev) ✓

COPY TO: R.F. D.E. C.R. H.U.

PARTICULARS:

LAB NO.	
3 3341	Raw - Pumphouse (#1)
3 3342	Treated - Pumphouse
3 3343	Golf Course (Green #7) +
3 3344	L. Eliason Residence +
3 3345	Murray's Store +
3 3366	Coast Hotel +
3 3347	#5 Hard Rock +

RESULTS PER 100 ML:

	FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
3 3341	0		1900	132
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
3 3342	0		0	2
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
3 3343	0		G300	2
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
3 3344	0		0	0
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
3 3345	0		G300	0
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
3 3346	0		G300	2
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
3 3347	0		4	0
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
	FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	

+ CHLORINE PRESENT
G & L MEANS GREATER THAN & LESS THAN

SEE REVERSE SIDE FOR INTERPRETATION

-1-

Appendix 7

MINISTRY OF THE ENVIRONMENT – LABORATORY BRANCH

BACTERIOLOGICAL REPORT

FILE: Dep. of Admore (Special Investigation)

DATE: SAMPLED D M Y 17 872 ANALYSED D M Y 18 872 REPORTED D M Y 19 872 3 3348 3 3348 Thunder Bay

REPORT TO: J.R. Marsh (Attn: R. Prankow) T.R.R.O.

COPY TO: R.F. D.R. C.R. H.U.

PARTICULARS:

LAB NO. 3 3348 Tee #7 – Golf Course 3 3348 +

RESULTS PER 100 ML:

FECAL COLIFORMS 0	PLATE COUNT	BACKGROUND COLONIES >300	COLIFORM BACTERIA 178
ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	

+ CHLORINE PRESENT

G & L MEANS GREATER THAN & LESS THAN

MINISTRY OF E ENVIRONMENT - LABORATORY ANCH

BACTERIOLOGICAL REPORT

FILE: Twp. of Animoore

DATE: SAMPLED D M Y 15 872 ANALYSED D M Y 16 872 REPORTED D M Y 1 972

1 3256 1 3263 Thunder Bay

REPORT TO: J.R. Marsh, T.B.R.C.

COPY TO: R.F. C.R.-circulate to S.Kanangone

PARTICULARS:

RESULTS PER 100 ML:

LAB NO.			FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
1 3256	Mouth of Wintering River	1 3256	8			2500
			ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3257	½ mi. N. of mouth of Wintering River	1 3257	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 160
			ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3258	1 mi. from mouth of Wintering River at Point	1 3258	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 104
			ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3259	1 mi. S/W of Pumphouse at Marrow	1 3259	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 352
			ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3260	L. Kanagamicia - water intake	1 3260	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 700
			ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3261	½ mi. S. pumphouse	1 3261	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 308
			ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3262	Opposite Elder Creek	1 3262	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 80
			ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3263	At Elder	1 3263	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 100
			ENTEROCOCUS 12	PSEUDOMONAS	CLOSTRIDIUM	

+ CHLORINE PRESENT
G & L MEANS GREATER THAN & LESS THAN

MINISTRY OF THE ENVIRONMENT - LABORATORY BRANCH

BACTERIOLOGICAL REPORT

FILE: Twp. of Ashmore

DATE: SAMPLED D M Y 15 872 ANALYSED D M Y 16 872 REPORTED D M Y 5 972

1 3264 1 3268 Thunder Bay

REPORT TO: J.R. Marsh, T.B.R.O.

COPY TO: R.F. C.R.-circulate to S.Marangoni

PARTICULARS:

LAB NO.

1 3264 ¼ mi. NW of Elder Cr. at Narrows

1 3265 at West Narrows

1 3266 Morton Townsite

1 3267 at Main Narrows

1 3268½ ½ mi. E. of Main Narrows

RESULTS PER 100 ML:

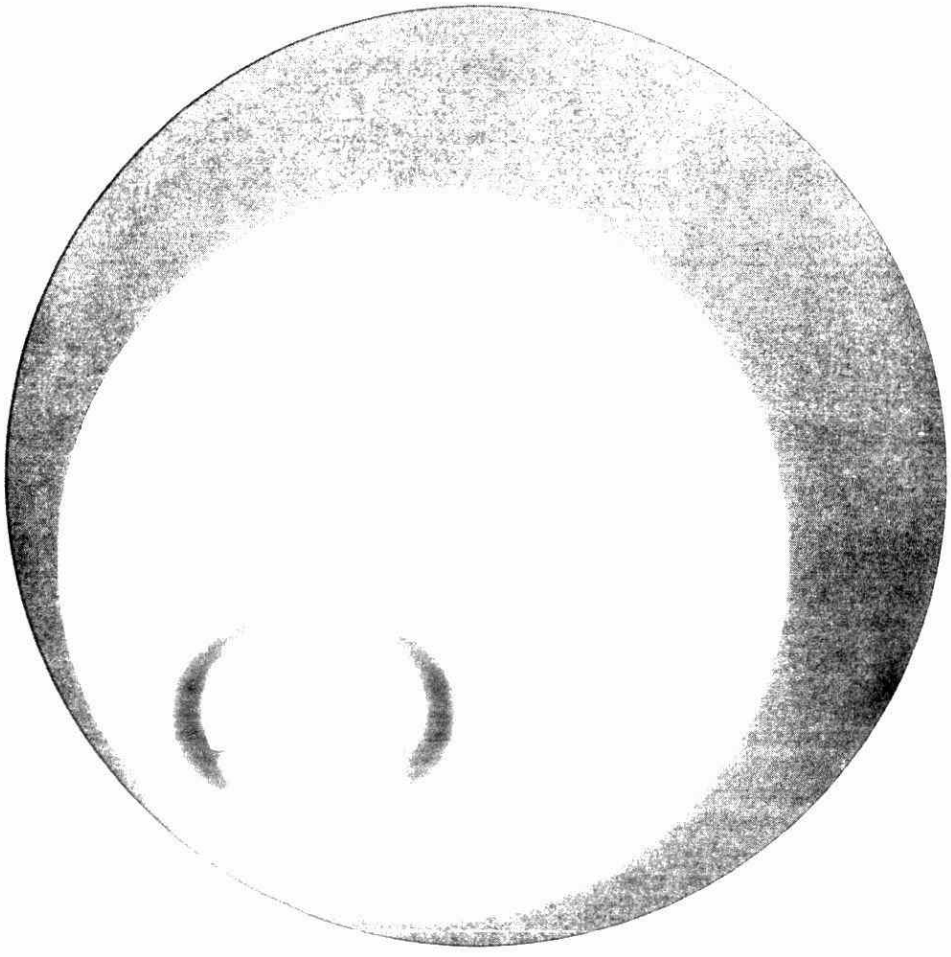
1 3264	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 84
	ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3265	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 8100
	ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3266	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 2000
	ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3267	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 1500
	ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
1 3268	FECAL COLIFORMS 1	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA 1100
	ENTEROCOCUS 1	PSEUDOMONAS	CLOSTRIDIUM	
	FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
	FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	
	FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
	ENTEROCOCUS	PSEUDOMONAS	CLOSTRIDIUM	

+ CHLORINE PRESENT
G & L MEANS GREATER THAN & LESS THAN

Barton
Bay
Hwy 11
West
Narrows
Main
Narrows
Morton's
Pumphouse
Eldee
Lake
Kenogamisis
Lake
Wintering
River

DRINKING WATER OBJECTIVES

APPENDIX 10



Water management in Ontario

DRINKING WATER OBJECTIVES

ONTARIO WATER RESOURCES COMMISSION

HON. GEORGE A. KERR, Q.C.
Minister

R. D. JOHNSTON
Chairman

J. H. H. ROOT, M.P.P.
Vice-Chairman

As approved by Ontario Water Resources Commission Feb. 27, 1964, and
Amended June 28, 1967.

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DRINKING WATER OBJECTIVES

ONTARIO WATER RESOURCES COMMISSION

INTRODUCTION

Water supplies for domestic purposes must be free from amounts of chemical substances and micro-organisms that would constitute a health hazard. Supplies of drinking water should not only be safe and free from dangers to health, but should also be as aesthetically attractive as possible. Absence of turbidity, color, and disagreeable or detectable tastes and odors is important in water supplies intended for domestic use. The location, construction, operation, and supervision of a water-supply system should exclude all potential sources of pollution and contamination.

In order to obtain drinking water having these desirable qualities, objectives regarding limits for certain substances should be achieved. The objectives should be generally acceptable and should be applicable to all public water supplies in the Province of Ontario.

The following two types of limits should be recognized:

a) Limits that, if exceeded, shall be grounds for rejection of the supply. Substances in this category may have adverse effects on health when present in concentrations above the limit.

b) Limits that should not be exceeded whenever more suitable supplies are, or can be made, available at a reasonable cost. Substances in this category, when present in concentrations above the limit, are either objectionable to an appreciable number of people or exceed the levels required by good water quality control practices. These limits should apply to the water at the free-flowing outlet of the ultimate consumer.

The limits presented are an effort to derive conservative values from the best information now available and may be adjusted as new and better data become available.

DEFINITION OF TERMS

The terms used in these objectives are as follows:

Adequate protection by natural means involves one or more of the following processes of nature that produce water consistently meeting the requirements of these objectives: dilution, storage, sedimentation, sunlight, aeration, and the associated physical and biological processes which tend to accomplish natural purification in surface waters and, in the case of ground waters, the natural purification of water by infiltration through soil and percolation through underlying material and storage below the water table.

Adequate protection by treatment is any one or any combination of the controlled processes of coagulation, sedimentation, absorption, filtration, disinfection, or other

processes that produce a water consistently meeting the requirements of these objectives. This protection requires processes that are appropriate to the source of supply; works that are of adequate capacity to meet maximum demands without creating health hazards, and that are located, designed, and constructed to eliminate or prevent pollution; and conscientious operation by well trained and competent personnel whose qualifications are commensurate with the responsibilities of the position and acceptable to the Ontario Water Resources Commission (OWRC).

The coliform group of micro-organisms includes all Gramnegative, non spore-forming aerobic and facultative anaerobic rod-shaped bacteria capable of fermenting lactose in a bile salt medium when incubated at 35 - 37°C. Gas and acid production within 48 hours under the above conditions is the criterion used in the multiple tube dilution method. In the membrane filter procedure, a properly tested procedure that will determine fermentation of lactose under the above conditions may be used. The production of a green-gold metallic sheen within 20 ± 2 hours on colonies growing on a membrane filter in the presence of a fuchsin-sulfite complex is widely used.

Health hazards are conditions, devices, or practices in the water-supply system and its operation that create, or may create, a danger to the health and well-being of the water consumer. An example of a health hazard is a structural defect in the water-supply system, whether of location, design or construction, which may regularly or occasionally prevent satisfactory purification of the water supply or cause it to be polluted from extraneous sources.

Pollution is defined as the presence of any foreign substance (organic, inorganic, radiological, or biological) in water that tends to degrade its quality so as to constitute a health hazard or impair the usefulness of the water.

A standard sample for bacteriological analysis shall consist of a minimum of 150 millilitres (ml) (approximately 6 ounces) of water collected in a glass container that has been sterilized by a recognized and tested laboratory procedure.

Water supply system includes the works and auxiliaries for collection, treatment, storage, and distribution of the water from the sources of supply to the free-flowing outlet of the ultimate consumer.

EXPRESSION OF RESULTS

Milligrams per litre (mg/l) are employed in these objectives as it is considered that the slightly less exact expression "parts per million" (ppm) should be progressively abandoned. Whenever possible, chemical components should be expressed in ions. Turbidity should be expressed in units of turbidity, and color in units of color based upon the platinum-cobalt scale. Volumes should be expressed in millilitres (ml), and temperature should be measured in degrees Fahrenheit (°F).

In bacteriological examinations, the total number of micro-organisms developing on solid media should be expressed in significant figures as colonies per 100 millilitres of sample liquid (water or waste water, etc.) and the medium, time, and temperature of incubation in degrees Centigrade (°C) with the quantity of material examined being stated. Coliform numbers should be given in terms of "Most Probable Number" per 100 ml (MPN/100 ml) or "Membrane Filter Count" per 100 ml (MFC/100 ml).

SOURCE AND PROTECTION

The water supply should be obtained from the most desirable source feasible, and effort should be made to prevent or control pollution of the source. If the source is not adequately protected by natural means, the supply shall be adequately protected by treatment.

Frequent sanitary surveys shall be made of the water-supply system to locate and identify health hazards which may exist in the system. The manner and frequency of making these surveys, and the rate at which discovered health hazards are to be removed, shall be in accordance with a program approved by the OWRC.

Approval of water supplies shall be dependent in part upon:

a) Enforcement of requirements to prevent development of health hazards;

b) Adequate protection of the water quality throughout all parts of the water-supply system, as demonstrated by frequent surveys;

c) Proper operation of the water-supply system under the responsible charge of personnel whose qualifications are acceptable to the OWRC;

d) Adequate capacity to meet peak demands without development of low pressures or other health hazards;

e) Records of laboratory examinations showing consistent compliance with the water quality requirements of these objectives.

For the purpose of application of these objectives, responsibility for the conditions in the water-supply system shall be considered to be held by:

a) The water purveyor, from the source of supply to the connection to the customer's service piping;

b) The owner of the property served and the municipal or other authority having legal jurisdiction, from the point of connection to the customer's service piping to the free-flowing outlet of the ultimate consumer.

BACTERIOLOGICAL QUALITY

No bacteriological examination of water, however exact, can take the place of a complete knowledge of the conditions at the sources of supply and throughout the distribution system. Every water supply should be regularly inspected from source to distribution taps, and sampling should be repeated under various climatic conditions, especially after heavy rainfall. It should be emphasized that when sanitary inspection indicates a water, as distributed, to be subject to pollution, the water should be considered suspect irrespective of the results of bacteriological examinations. Contamination is often intermittent and may not be revealed by the examination of a single sample. The examination of a single sample can indicate no more than the conditions prevailing at the moment of sampling; a satisfactory result cannot guarantee that the observed conditions will persist in the future. The quality of a water supply can be assessed only by a series of samples over a period of time.

Sampling

Sterile bottles, six ounces (180 ml) or more, must be used to collect samples for submission to the OWRC laboratory for bacterial analysis. To ensure reliable results, samples should arrive at the testing laboratory within 24 hours of sampling or be refrigerated if delay is unavoidable. Samples from distribution systems should be taken only after water has been flowing for two minutes. The samples should be collected directly into sterile bottles, not by means of a dipper or other container. An air space should be left in the bottle unless other instructions are given.

Frequency of Sampling

The frequency of bacteriological examinations for the control of the sanitary quality of a water supply and the location of sampling points at pumping stations, treatment points, reservoirs, and booster pumping stations, as well as in the distribution system, should be such as to enable proper supervision of the bacteriological quality of the water supply to be maintained. The frequency of examinations and the location of sampling points shall be established by the OWRC after investigation of the source, method of treatment, and protection of the water concerned. The samples shall not necessarily be taken from the same point on each occasion. Only properly collected samples are suitable for analysis, and only these will be considered in determining the quality of a supply.

Plant Samples

In systems utilizing treated surface water, samples shall be taken and examined not less than once per week from the raw water source and the point at which treated water enters the distribution system. In systems utilizing treated ground-water, samples shall be taken and examined not less than twice per month, from the raw water source and the point at which the treated water enters the distribution system. In addition, there should be several checks on the chemical disinfection process each day.

In systems utilizing untreated ground water, samples shall be taken and examined not less than once per week from the source and all points at which water enters the distribution system.

Distribution System Samples (Piped Systems)

The minimum number of samples to be collected and the frequency of sample collection from a distribution system shall be determined from the following table.

Population Served	Minimum Number of Samples Per Month	Minimum Frequency of Sampling Intervals
Up to 1,000	2	2 per month
1,001 - 100,000	10 + 1 per 1,000 of population per month	1 per week
Over 100,000	100 + 1 per 10,000 of population per month	1 per day

The number of samples determined with the use of the above table shall not include plant effluents whether treated or otherwise.

In determining the number of samples examined monthly, the following samples may be included, provided they have been examined by methods acceptable to the OWRC and the results are assembled and available for inspection by the OWRC.

(1) Samples examined by the OWRC laboratory.

(2) Samples examined by other government laboratories, either federal or provincial.

(3) Samples examined by water works authorities or by commercial laboratories, provided the analytical results are acceptable to the OWRC.

Special Samples

Special samples shall be additional samples collected following a bacteriologically unsatisfactory sample as provided in the section "Limits for Piped Supplies". They shall not be included in the total number of samples examined. Such samples shall not be used as a basis for prohibiting the supply provided that:

1. when waters of unknown quality are being examined, tests are made to determine a definitive coliform content;

2. immediate and active efforts are made to locate the cause of pollution;

3. immediate action is taken to eliminate the cause; and

4. samples taken following such remedial action are satisfactory.

Samples taken because of and following periods of heavy rainfall, spring runoffs, and drought with increased water consumption shall be considered as special samples.

Limits for Piped Supplies

The appearance of coliform organisms in a 100 ml sample of waters that are normally pure, calls for immediate investigation. In order to provide objectives for laboratories which are conducting bacteriological analysis by either the Most Probable Number technique or the Membrane Filter technique, coliform analyses by both techniques will be considered.

Most Probable Number (MPN) Procedure

(1) In MPN techniques the examination of water samples should result in 90% of the samples per month being negative for coliform organisms.

(2) None of the samples positive for coliform organisms should have an MPN index greater than ten per 100 ml.

(3) Samples of water which produce an MPN index of eight to ten in consecutive examinations should be immediately investigated and "special samples" should be collected.

Any deviation from these objectives should result in the immediate collection of "special samples" of the water supply and the commencement of appropriate remedial action to safeguard the purity of the water supplied to the consumer. The "repeat" samples should be examined so that an estimate of the number of coliform organisms present can be obtained. Five 10 ml, 1 ml, and 0.1 ml portions, for example, of the sample should be used.

Membrane Filter (MF) Procedure

(1) In MF techniques the examination of water samples should result in 90% of the water samples per month being negative for coliform organisms.

(2) None of the positive samples should have a coliform count greater than three per 50 ml, four per 100 ml, seven per 200 ml or thirteen per 500 ml.

(3) If a sample of water exceeds the above limits or approaches these limits in consecutive samples, an immediate investigation of the source should be instituted.

Any deviation from these objectives should result in the immediate collection of "special samples" of the water supply and the commencement of appropriate remedial action to safeguard the purity of the water supplied to the consumer.

PHYSICAL CHARACTERISTICS

Sampling

The minimum standards for frequency and manner of sampling shall be as determined by the OWRC. Under normal circumstances, samples should be collected one or more times per week from representative points in the distribution system and examined for turbidity, color, threshold odor, and taste.

Limits

Drinking water should contain no impurity which would cause offence to the sense of sight, taste, or smell. Under general use, the following limits should not be exceeded: turbidity, 1 unit; color, 5 units; and threshold odor number, 3.

Analytical Methods

The methods used for determining the physical characteristics shall be as prescribed in the current edition of Standard Methods for the Examination of Water and Wastewater.

CHEMICAL CHARACTERISTICS

Sampling

The minimum standards for frequency and manner of sampling shall be as determined by the OWRC. Under normal circumstances, analyses for substances listed below need be made only semi-annually. If, however, there is some presumption of unfitness because of the presence of undesirable elements, compounds, or materials, periodic determinations for the suspected toxicant or material should be made more frequently, and an exhaustive sanitary survey should be made to determine the source of the pollution. Where the concentration of a substance is not expected to increase in processing and distribution, available and acceptable source-water analyses performed in accordance with standard methods may be used as evidence of compliance with these objectives.

Where experience, examination, and available evidence indicate that particular substances are consistently absent from a water supply or below levels of concern, semi-annual examinations for those substances may be omitted when approved by the OWRC.

Limits

Drinking water shall not contain impurities in concentrations that may be hazardous to the health of the consumers. It should not be excessively corrosive to the water-supply system. Substances used in its treatment shall not remain in the water in concentrations greater than required by good practice. Substances that may have deleterious physiological effect, or substances for which physiological effects are not known, shall not be introduced into the system in a manner that would permit them to reach the consumer.

The chemical substances shown in Table 1 should not be present in a water supply in excess of the listed concentrations where, in the judgment of the OWRC, other more suitable supplies are or can be made available.

TABLE 1

Substance	Concentration mg/l
Alkyl benzene sulfonate (ABS)	0.5
Arsenic (As)	0.01
Chloride (Cl)	250.0
Copper (Cu)	1.0
Carbon chloroform extract (CCE)	0.2
Cyanide (CN)	0.01
Fluoride (F)	*
Iron (Fe)	0.3
Manganese (Mn)	0.05
Nitrate (NO_3) **	45.0
Phenols	0.001
Sulfate (SO_4)	250.0
Total dissolved solids	500.0
Zinc (Zn)	5.0

* See section on Fluoride

** In areas in which the nitrate content of water is known to be in excess of the listed concentration, the public should be warned of the potential dangers of using the water for infant feeding.

The presence of substances in excess of the concentrations listed in Table 2 shall constitute grounds for rejection of the supply.

TABLE 2

Substance	Concentration mg/l
Arsenic (As)	0.05
Barium (Ba)	1.0
Cadmium (Cd)	0.01
Chromium (Cr^{6+})	0.05
Cyanide (CN)	0.2
Fluoride (F)	*
Lead (Pb)	0.05
Selenium (Se)	0.01
Silver (Ag)	0.05

* See section on Fluoride

Fluoride

When fluoride is naturally present in drinking water, the concentration should not average more than 1.2 mg/l. Presence of fluoride in concentrations more than 2.4 mg/l shall constitute grounds for rejection of the supply.

Where fluoridation (supplementation of fluoride in drinking water) is practised, the fluoride concentration recommended is 1 mg/l with a permissible operating range of 0.8 mg/l to 1.2 mg/l.

Fluoridated and defluoridated supplies shall be sampled with sufficient frequency to determine that the desired fluoride concentration is maintained.

Analytical Methods

The methods used for determining the chemical characteristics shall be as prescribed in the current edition of Standard Methods for the Examination of Water and Wastewater.

RADIOACTIVITY

Sampling

The frequency of sampling and analysis for radioactivity shall be determined by the OWRC after consideration of the likelihood of significant amounts being present. Where concentrations of Radium-226 (Ra^{226}) and Strontium-90 (Sr^{90}) may vary considerably, quarterly samples composited over a period of three months are recommended. Samples for determination of gross activity should be taken and analyzed more frequently.

As indicated in "Chemical Characteristics", data from water analyses of available and acceptable sources may be used to indicate compliance with these requirements.

Limits

The effects of the exposure of humans to radiation is viewed as harmful, and any unnecessary exposure to ionizing radiation should be avoided. The concentrations of radioactivity specified in Table 3 for drinking water are intended to limit intake of the substances by this route, so that total radiation exposure of population groups does not exceed appropriate "Radiation Protection Guides" recommended by the United States Federal Radiation Council. Concentrations which exceed, on the average, the values presented in Table 3 for a period of one year shall constitute grounds for rejection of the supply. Where the total intake of Ra^{226} and Sr^{90} from all sources has been determined, the limits may be adjusted by the OWRC so that the total intake of Ra^{226} and Sr^{90} will not exceed 7.3 micro micro-curies (μμc) per day and 73 μμc/day, respectively.

TABLE 3

Radionuclides	Concentration μμc 1
Radium-226 (Ra^{226})	3
Strontium-90 (Sr^{90})	10
Gross beta activity (Sr^{90} and alpha emitters absent*)	1,000

* Absent is taken here to mean a negligibly small fraction of the above specific limits, where the limit for unidentified alpha emitters is taken as the listed limit for Ra^{226}.

When mixtures of Ra^{226}, and Sr^{90}, and other radionuclides are present, the above limiting values shall be modified to ensure that the combined intake is not likely to result in radiation exposure in excess of the Radiation Protection Guides recommended by the United States Federal Radiation Council.

BIBLIOGRAPHY

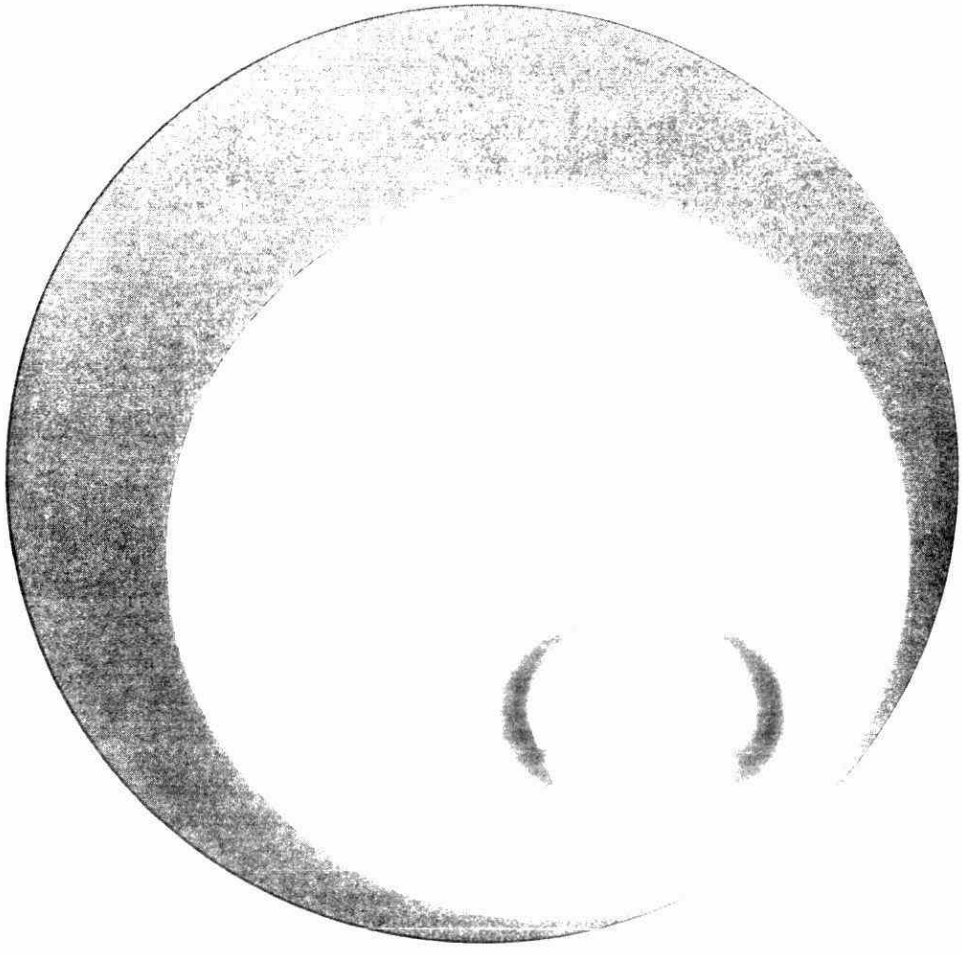
1. Public Health Service Drinking Water Standards, U.S. Department of Health, Education & Welfare, 1962.

2. International Standards for Drinking Water, World Health Organization, 1958.

3. European Standards for Drinking Water, World Health Organization, 1961.

4. Standard Methods for the Examination of Water & Wastewater A.P.H.A., A.W.W.A. and W.P.C.F. (11th ed., 1960).

5. Radiation Protection Guides recommended by the Federal Radiation Council U.S.A.



ONTARIO WATER RESOURCES COMMISSION

PUBLIC RELATIONS AND INFORMATION

135 ST. CLAIR AVE., WEST TORONTO 195, ONTARIO